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A COMPARATIVE STUDY OF FIGURE OF EIGHT SCAPULAR BRACE AND SCAPULAR STABILIZATION EXERCISES FOR FORWARD HEAD ROUNDED SHOULDER POSTURE (FHRSP) IN PATIENTS WITH CHRONIC NECK PAIN

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ABSTRACT

Background: Forward head posture is one of the most common cervical abnormalities that leads to neck pain. The purpose of this study was to investigate the effects of scapular stabilization exercises versus scapular brace on neck posture, pain, and quality of life in individuals with forward head posture.

Method: 30 subjects (21 males & 9 female) with chronic neck pain were included as per inclusion criteria neck pain > 6 months, Shoulder girdle flexibility test [fingertips > 2 inches (5cm) apart]. Subjects with h/o polytrauma, psychiatry illness and pregnant women were excluded. Participants were randomly allocated to two groups: experimental group (n=15), treated with, figure of eight scapular brace and scapular stabilization exercise and control group (n=15) group, received only scapular stabilization exercises. The subjects in intervention group were instructed to wear the brace minimum six hours in a day with 30 minutes in continuation. Pain, NDI score, forward head & forward shoulder angle were measured before and after six weeks exercise program.

Result: The brace along with scapular stabilization exercises decreased NDI score significantly (27.00% (95% C.I. 22.66%, 31.34%) in experimental than control 33.13% (95% C.I. 28.56%, 37.71%) group. The change in VAS scores after intervention were greater in the experimental (2.53,95% C.I. 2.12 to 2.94) as compared to the control group (2.07, 95% C.I. 1.74 to 2.40).

Conclusion: The application of figure of eight scapular brace along with scapular stabilization exercises improved shoulder posture and scapular stability with reduction in pain in patients with chronic neck pain.

KEY WORDS: Forward head, Neck Disability Index, Neck pain, Scapular stabilization exercises, Scapula brace.

INTRODUCTION:

Forward head posture (FHP) is one of the most common cervical abnormalities that frequently appears in the patients with neck disorders.[1]

Forward head posture is characterized by increased flexion of the lower cervical and upper thoracic regions, increased extension of the occiput on the first cervical vertebra, and increased extension of the upper cervical vertebrae. **Rounded-shoulder posture** (RSP) is characterized by a protracted, downwardly rotated, and anteriorly tipped scapula position with increased cervical lordosis and upper thoracic kyphosis.[2] Forward-head rounded-shoulder posture (FHRSP) is defined as excessive anterior orientation of the head or glenohumeral joint relative to the vertical plumb line of the body.[3] Scapular stabilization exercises in individuals with neck pain and forward head posture improves scapular position and kinematic by facilitating the weak muscles and inhibiting over activity of the muscle.[4] Bracing around the shoulder girdle, restores normal shoulder posture and scapular position that helps to maintain the proximal shoulder girdle stability and reduces pain.[5]

The purpose of this study was to investigate the effects of scapular brace with stabilization exercises on posture in individuals with neck pain and forward head posture.

MATERIALS AND METHODS:

Design of study: Randomized control trial – comparative study.

Sample size: Convenient sampling

Participants:

Subjects with chronic neck pain were included with convenient sampling and screening of sixty subjects for FHRSP was done using shoulder girdle flexibility test. Thirty subjects were selected after screening, meeting the inclusion criteria [fingertips are greater than 2 inches (5cm) apart on shoulder girdle flexibility test]. Subjects were enrolled in the study after signing of the consent form. The study was approved by Institutional Ethics Committee of Human Research, Lokmanya Tilak Municipal Medical College (LTMMC).

Selected subjects were randomly distributed in experimental group (n=15) and control group (n=15) by using lottery method. Experimental group, received figure of eight scapular brace along with scapular stabilization exercises.

Whereas control group received only scapular stabilization exercises. Pre and Post assessments were done by the researchers at the baseline and after six weeks respectively.

Assessment Tool:

Shoulder girdle flexibility test [6]

The left shoulder was tested by standing with the right arm straight up and then bending the elbow so the hand hangs behind the head. Keeping the upper arm stationary, the palm was rested between the shoulder blades. Then subject was asked to reach around behind with his left arm so the palm is facing out and then try to touch the fingers of both hands together. The procedure was repeated with the opposite shoulder. The scoring was based on the minimum distance between hands (good, fingertips are touching together; fair, fingertips are not touching but are less than two inches apart; poor, fingertips are greater than two inches apart).

Outcome measure:

Neck Disability Index [7]

The Neck Disability Index (NDI) is a ten-item questionnaire that assesses disability associated with neck pain. There are four items that relate to subjective symptomatology (pain intensity, headache, concentration, sleeping) and six items that relate to activities of daily living (lifting, work, driving, recreation, personal care, reading). The questionnaire requires only 5–10 minutes to complete and score, and requires no special training to administer. Responses for each item ranging from no disability (0) to total disability (5). The ten items are summed to gain the total score thus ranging from 0 (no disability) to 50 (maximum disability). A score of less than 4 indicates no disability, 5–14 mild disability, 15–24 moderate disability, 25–34 severe disability, and scores greater than 35 complete disability. Validity and test-retest reliability has been found to be high (Pearson's r = 0.95 and 0.94 respectively) in a cohort of chronic neck pain participants.

Visual Analog Scale (VAS)[8]

A Visual Analog Scale (VAS) is a unidimensional measure of pain intensity. It is a 10-cm line that represents a continuum between the two ends of the scale—"no pain" on the left end (0 cm) of the scale and the "worst pain" on the right end of the scale (10 cm) The patients' marks are recorded in centimeters and are interpreted as their pain. Test–retest reliability has been shown to be good, but higher among literate ®= 0.94, P= 0.001) than illiterate patients (r = 0.71, P= 0.001)

Forward Head Angle (FHA) & Forward Shoulder Angle (FSA)[9]

Forward head angle was determined by measuring the angle between a line drawn from the tragus to the C7 spinous process and a vertical plumb line through C7. Forward shoulder angle was determined by measuring the angle between a line drawn from the tip of the acromion process to the C7 spinous process and a vertical plumb line through C7 (Fig.1)

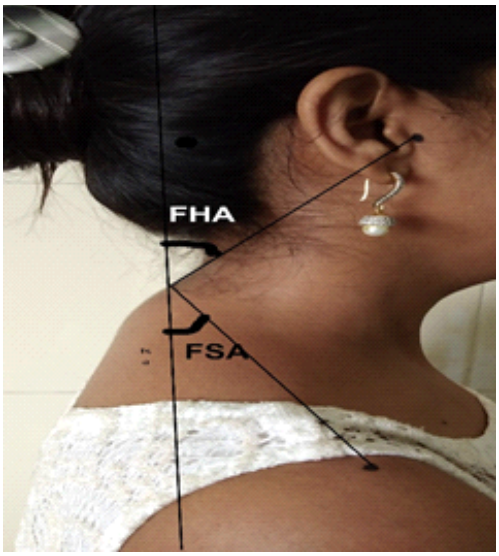

Figure.1 Measurement of FHA and FSA

Intervention: Scapular stabilization exercises were given which included T to Y to W exercises for six weeks. [Fig.2,3,4,5]. The patient was positioned in prone with arms abducted to 90° (the letter T); then was told to do flexion at the elbows to 90°, retracting his scapula and externally rotating his arms while keeping his arm in 90° abduction. Then maintaining retraction of scapula, the patient was told to raise his arms above the head and extend the elbow while keeping arm in flexion and abduction to 120° (the letter Y). After that, maintaining the retraction of scapula, they were shown to flex the elbows and extend their shoulders to form (the letter W). For scapular protraction patient was positioned in a prone with toes and forearms supported the body, then push up 1-2cm and scapula protraction.[10]

Figure. 2 T's position exercise

Figure.3 Y's position exercise

Figure. 4 W's position exercise

Figure. 5 Push up exercise

Figure. 6 Scapular Brace:

The unisex brace was designed in a pattern of figure of eight which was made up of cloth, padded adjustable straps passing through circular metal ring. The ring over the back helps to hold the brace in position. The brace was designed and constructed by the researchers with the help of orthotician in the department. The cost of brace was rupees 150 which was born by the researchers. This brace was worn on upper back on normal clothing (Figure 6). Training for donning and doffing of the brace was given to each subject. The subjects were advised to wear the brace for 6 hours/day in continuation for 30 minutes during office hours for six weeks. As the brace had adjustable straps and adequate padding subjects were comfortable using the brace.

DATA ANALYSIS :

The data was entered using MS-Excel-2016 and analyzed using SPSS Software version16. Paired t-test was used as statistical tests of significance. Pearson Correlation Coefficient was used to study correlation of FHRSP with VAS. P value was set at 0.05 level of significance and 95%confidence interval (CI) value were computed.

RESULTS:

Table 1: Demography of Patient Enrolled

		Group	N	Mean (SD)	Total (%)
Age (yrs)		Experimental	15	29.67 (7.706)	15(100%)
		Control	15	34 (9.152)	15(100%)
Sex	Male	Experimental	7	-	21(70%)
		Control	14	-	21(66%)
	Female	Experimental	8	-	9(88%)
		Control	1	-	9(11%)

Table 2: NDI Scores in the Two Groups

	Experimental			Control			Between group comparison
	Mean	C.I for mean	SD	Mean	C.I for mean	SD	P value
Pre	49.04%	41.02%, 57.07%	14.49%	57.60%	53.39%, 61.81%	7.60%	0.172, Not significant
Post	27.00%	22.66%, 31.34%	7.83%	33.13%	28.56%, 37.71%	8.26%	0.052, significant
Change from pre	22.04%	17.55%, 26.54%	8.12%	24.47%	21.27%, 27.67%	5.78%	0.046, significant

Post intervention there was significant reduction in NDI score [95% CI: 17.55%, 26.54%] in Experimental (Braces) group and (95% C.I. 21.27%, 27.67%) in Control group. (Table 2)

Table 3: FHA Scores in the Two Groups

	Experimental			Control			Between group comparison
	Mean	C.I for mean	SD	Mean	C.I for mean	SD	P value
Pre	41.33	40.10, 42.57	2.23	39.47	38.40, 40.53	1.92	0.020, significant
Post	37.73	36.81, 38.66	1.67	38.47	37.10, 39.84	2.47	0.349, Not significant
Change from pre	3.60	2.74, 4.46	1.55	1.00	0.45, 1.55	1.00	<0.0001, significant

The change in FHA scores after intervention were statistically significant in the Experimental group (95% C.I. 2.74 to 4.46) as compared to the Control group (95% C.I. 0.45 to 1.55). [Table-3]

Table 4: FSA Scores in the Two Groups

	Experimental			Control			Between group comparison
	Mean	C.I for mean	SD	Mean	C.I for mean	SD	P value
Pre	29.33	28.43, 30.24	1.63	29.33	28.43, 30.24	1.63	1.000, Not significant
Post	24.67	23.87, 25.47	1.45	28.27	27.17, 29.36	1.98	<0.0001, significant
Change from pre	4.67	3.87, 5.47	1.45	1.07	0.49, 1.64	1.03	<0.0001, significant

Shows the change in FSA scores after intervention were statistically significant in the Experimental group (95% C.I. 3.87 to 5.47) as compared to the Control group (95% C.I. 0.49 to 1.64) [Table-4]

Table 5: VAS Scores in the Two Groups

	Experimental			Control			Between group comparison
	Mean	C.I for mean	SD	Mean	C.I for mean	SD	P value
Pre	6.47	5.92, 7.02	0.99	5.67	5.17, 6.16	0.90	0.028, significant
Post	3.93	3.49, 4.38	0.80	3.60	3.02, 4.18	1.06	0.338, Not significant
Change from pre	2.53	2.12, 2.94	0.74	2.07	1.74, 2.40	0.59	0.068, Not significant

The change in VAS scores after intervention were statistically significant in the Experimental group (95% C.I. 2.12 to 2.94) as compared to the Control group (95% C.I. 1.74 to 2.40)

Table 6: Correlation of VAS with FHA and FSA

		Forward Head Angle	Forward Shoulder Angle
Visual Analogue Scale	Pearson Correlation	0.335	0.476
	Sig. (2-tailed)	0.009	<0.0001
	Correlation	Statistically Significant	Statistically significant

Shows statistically significant positive correlation of FHA and FSA with VAS.

DISCUSSION:

Our study was conducted on 30 patients with the mean age (29.67 ±7.706) years for experimental group and (34 ± 9.152) years for control group. [Table.1] A strong evidence was found to relate neck pain for this age group, who spent more time in texting messages on mobile phones or using computers, due to increase use of new information and communication technologies. This has led to holding the neck in a forward bent posture for a prolonged time and making repetitive movements.[11]

In our study, scapular stabilization exercises along with scapular brace, showed significant decrease in NDI (P= 0.046), FHA and FSA (p<0.0001) score within group, which may have led to decrease in the forward head and rounded shoulder posture. However, we did not observe between-group differences for NDI and FHA following the intervention. [Table. 2,3,4]

Our study demonstrated that scapular stabilization (L TO Y) exercises targeting the neck and shoulder areas, three times a week, for six weeks, significantly reduced neck pain and increased neck and shoulder functions by reducing FHA and FSA. These exercises cause maximum scapular depression, leading to increased activity in the lower trapezius muscle by externally rotating the shoulder to end range at 90° of abduction[12] Thus, stretching the cervical and pectoral muscles help to reduce the imbalances of the underlying soft tissues. [13]

Our results were in line with previous studies by Hakkinen et al revealed that, stretching exercise five times per week, during four weeks, was effective for reducing pain in women with chronic neck pain. [14]

Further it can be supported by Zahra Abdollahzade et.al (2017), concluded that a 4-weeks stretching exercises (performed four times per week) improved postural parameters which were enough for correcting FHP in the females with forward head rounded shoulder posture.[13]

A study by Kluemper et al. found decreased RSP following a 6-week intervention including stretching of the anterior shoulder muscles and strengthening of the posterior shoulder muscles in competitive swimmers with forward shoulder posture.[15]

FHP can be corrected by restoring the normal muscle balance between agonist and antagonist muscles.[3] Thus, the figure of eight brace was introduced to maintain the scapula in normal position and improve the posture.

The strapping system of the brace may have helped to improve the scapular kinematics and to keep scapula in normal position. Thus, the compressive aspects of brace may have improved posture and decrease the neck pain.

Scapular stabilizing brace trigger the body to correct improper posture by re-educating the musculo-skeletal system surrounding the shoulders and spine.[16] Further, the posture compression garment causes scapula to be in neutral position and maintain posterior tilt which helps in improving posture.[17] The use of brace and scapular exercises might have helped in improving scapula and neck alignment thus reducing the neck pain.

In present study, the results showed clinically significant decrease in VAS score for experimental group compared to control group although it was not statistically significant in both the groups. [Table.5] Maintaining FHP for a long period of time, increases the load on noncontractive structures in the posterior craniocervical area, leads to myofascial pain.[18] This is supported by, Boyoung Im (2015), stated that VAS score significantly decreased and NDI score improved with scapular stabilisation exercises.[19]

In current study, a significant positive correlation was observed between VAS with FHA (P< 0.05) and FSA (P<0.0001). The FHP causes shoulder and neck pain. by moving the gravitational centre (the head) ahead of the load bearing axis which increases stress and can cause musculoskeletal damage or pain.[20]

Motiallah Tahereh et all (2013), found that patients with chronic neck pain had significant association with forward head and rounded shoulder postures compared with normal subjects.[21]

Nesreen Fawzy Mahmoud (2019) in his study, found a significant correlation between FHP and neck pain intensity, indicating that increased neck pain is associated with increased FHP.[11] Previous studies have demonstrated that forward head posture increases scapula deformation and lordosis of the cervical vertebra which causes neck pain. Thus, the results of this study support the clinical finding that there is a correlation between neck pain in patients with forward head rounded shoulder posture.

The limitations of the study were that the study was conducted for a limited duration so the long-term effect of the brace could not be studied. The generalisation of the results was not possible owing to a small sample size. Another limitation is that the relationship of cause for forward head posture and pain was not investigated in this study. Future research should investigate the cumulative effects of wearing the brace while performing exercises to determine whether or not changes continue to occur. Further recommendation is to conduct a longitudinal study with long-term follow-up, is needed to validate the findings of the present study.

CONCLUSION:

The results of this study indicate that figure of eight scapular brace along with scapular stabilization exercise improves forward head rounded shoulder posture in patients with chronic neck pain. Thus, the brace may be utilized in conjunction with the standard rehabilitation program for correcting poor habitual neck posture.

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